

5-3 Indirect Proof

Indirect Proof

1. Assume conclusion is false
2. Reason until you contradict the given
3. State assumption is false

Example 1

Given: Mary received an A on the test.

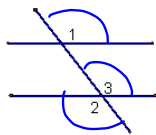
Prove: Her grade was $\geq 90\%$.

Assume Mary earned an 89.
Then she would have received a B,
which contradicts our given.
Our assumption is false, Mary's
grade was $\geq 90\%$.

Example 2

Given: $\angle 1 \cong \angle 2$

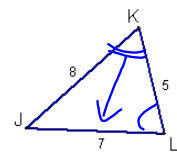
Prove: $\angle 1 \cong \angle 3$



- ① Assume $\angle 1 \cong \angle 3$
- ② $\angle 3 \cong \angle 2$ b/c vert. \angle s \cong
then $\angle 1 \cong \angle 2$ by transitive
* Contradicts our given
- ③ Our assumption is false
 $\therefore \angle 1 \not\cong \angle 3$
↑
therefore

Example 3

Given: picture



Prove: $m\angle K < m\angle L$

- ① Assume $m\angle K > m\angle L$ Case 1
 - ② then $JL > JK$ by Thm 5.10
* Contradicts given
 - ② then $JL = JK$ by \triangle Thm converse
* Contradicts given Case 2
 $m\angle K = m\angle L$
- Our assumptions are false
 $\therefore m\angle K < m\angle L$

Example 4

Given: $\frac{1}{2y+4} = 20$

Prove: $y \neq -2$

① Assume $y = -2$

② $\frac{1}{2(-2)+4} = 20$

$\frac{1}{0} \neq 20$

* Contradiction of given

③ Our assumption is false

$\therefore y \neq -2$

Homework

p. 258 #s 13-17, 19, 21, 22
not 15

Write the assumption you would make to start an indirect proof of each statement.

13. $\overline{PQ} \cong \overline{ST}$

14. If $3x > 12$, then $x > 4$.

~~15. If a rational number is any number that can be expressed as $\frac{a}{b}$, where a and b are integers, and $b \neq 0$, $\frac{a}{b}$ is a rational number.~~

16. A median of an isosceles triangle is also an altitude.

17. Points P , Q , and R are collinear.

PROOF Write an indirect proof.

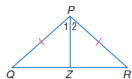
19. Given: $\frac{1}{a} < 0$

Prove: a is negative.

21. Given: $\overline{PQ} \cong \overline{PR}$

$\angle 1 \neq \angle 2$

Prove: \overline{PZ} is not a median of $\triangle PQR$.



22. Given: $m\angle 2 \neq m\angle 1$

Prove: $\ell \parallel m$

